

Army's Combat Surveillance Program Seen Paying Off With Effective Equipment

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WHEN the weapon was a stone—and the enemy a stone throwing man—eyes and ears were sufficient for area surveillance and target acquisition. As the rifle and the artillery piece increased the range of the soldiers' effectiveness, it was necessary to augment the capability of the eye with the binocular and the airplane and the capability of the ear with the radio. Today, ballistic missiles and the envisioned dispersion of the nuclear battlefield require surveillance and target acquisition systems in the U. S. Army that are as elaborate as the weapon systems that they must complement.



B/G Thames

In the years that followed 1945 our Army developed weapons of enormous range and lethality. It was absolutely necessary to develop a commensurate ability to acquire information about the enemy against whom these new weapons would be used on the battlefield. As a corollary, the development of a commensurate ability to locate the targets for these weapons was equally compelling. To fail to do so would leave our Army in the position of a hunter with a very fine sporting rifle—but minus a sight.

In July 1956 the Chief Signal Officer of the U. S. Army was given the responsibility for developing an adequate combat surveillance and target acquisition capability at the earliest possible date. The discharge of this responsibility led to the establishment of the U. S. Army Combat Surveillance Agency (USACSA) as a Class II activity of the Chief Signal Officer.

Agency's Mission

The mission of the Combat Surveillance Agency is to direct and supervise the Chief Signal Officer's effort in all phases of the development of combat surveillance equipment and systems. The Agency is charged with the coordination of the combat surveillance activities of installations and facilities under the control of the Chief Signal Officer. In the discharge of its responsibility, the Agency must provide coordination between the Office of the Chief Signal Officer and the combat surveillance activities of other Technical Services, the Department of the Army Staff, the Navy and the Air Force. The Commanding General of the Agency serves as the Special Assistant to the Chief Signal Officer for Combat Surveillance.

Because of the urgency of bringing the Army's combat surveillance capability into proportion with its weapons capability, it was necessary to establish rather unconventional general program objectives for the Agency. These objectives are referred to as "unconventional" because they differed somewhat from the normal procedure of placing new equipment in the hands of troops. This came about because we had had no previous generation of similar electronic combat surveillance equipment. The Army was in a position somewhat analogous to that of the original artillery man who had no previous catapult to guide him in the design of a new one.

Program Objectives

These program objectives for the Agency were:

1. As rapidly as possible to provide the Army the best equipment presently available or in the final stages of development. Attainment of this capability will give the field commanders

an increased intelligence capability will increase the effectiveness of tactical units as a result of this increased intelligence capability, will provide tactical units with experience and training, and will provide a basis for the development of future equipment.

2. To develop an advanced interim capability in the mid-range time period by using the best techniques that the state-of-the-art allows. This will provide equipment and systems for the 1962-65 period.

3. To pursue research and development activities vigorously with a view to advancing the state-of-the-art and exploiting technical break-throughs. Accomplishment of this objective will provide the Army with a greatly improved and highly effective combat surveillance and target acquisition capability by about 1970.

A management aspect involved in the achievement of each of the foregoing objectives involves the acquisition of full knowledge of the existing state-of-the-art in many fields and of the technical break-throughs that occur—or ap-

pear to be possible—within these fields. To develop meaningful programs, it is mandatory that the Agency have available the best possible estimates of the technical proficiency and state-of-the-art which can reasonably be anticipated at a specified time in the future. Management of the combat surveillance program is dependent upon such estimates and upon the existence of technological experimentation within the electronic industry and the other industries that can be foreseen to be involved in the development of surveillance systems.

The U. S. Army Signal Engineering Laboratory at Ft. Monmouth, N. J., conducts applied research concerning equipment deemed to be within the present state-of-the-art. It performs engineering design and conducts engineering tests on new or improved equipment and performs some basic research in areas where Project Michigan is not appropriately suited. As a check on the practicality of projected equipment concepts, the laboratory's work is invaluable to management decisions.

Army Combat Surveillance Agency Chief Tells Gains With Industry's Help

Charts As Management Tool

To coordinate and direct the combat surveillance activities of Cornell Aeronautical Laboratories, Project Michigan, the U. S. Army Electronic Proving Ground and the U. S. Army Signal Engineering Laboratory, it was necessary to develop a standardized method of monitoring each combat surveillance program. Because it is not feasible for management to review and analyze the entire history of a system under development each time a policy decision respecting the system must be made, standardized line-of-balance charts were instituted for each program. These charts are standardized in their technique of data presentation and are prepared for all combat surveillance programs undertaken by the Agency. The initiation and maintenance of these charts is accomplished by a staff member of the Agency who has complete responsibility for the effective charting of projects from inception to completion.

The value of these charts as a management tool is three-fold.

1. They clearly portray progress in each phase of research and development and in the engineering and service test phases of individual projects. Simultaneously they provide pertinent funding status information.

2. They provide a visual concept of these programs for briefing appropriate high authorities on the current status of the Army combat surveillance research and development effort. They additionally provide a ready means of portraying supporting fund information.

3. They serve as a historical record for the Agency.

To prepare a realistic schedule of the development of a complex surveillance system, advantage must be taken of every available source of information. In addition to the military and civilian agencies discussed above, the Agency procures information that is essential to management by liaison with the arms

and services of the Army, with the Air Force, with the Navy, with the Marine Corps, and with industry. Those members of the Agency engaging in this liaison acquire an intimate knowledge of all phases of their work and constantly increase the value to management of their recommendations.

I believe our technical and liaison programs have aided in augmenting the maximum Army surveillance capability commensurate with industry's capability to produce. An added benefit of the programs has been the fact that they have, in some instances, pointed the way to develop an industrial technological capability in surveillance fields that might not otherwise have been available.

Spotlight On Drones

Because it is one of the more glamorous achievements of our activity to date, I would like to highlight some of the managerial aspects of the surveillance drone program. The program grew, of course, from the need for extended area surveillance and target acquisition which must necessarily involve the aerial penetration of many miles of heavily defended enemy territory. It has been apparent for some time that the high performance unmanned drone—with its inherent courage—is a logical vehicle for such surveillance.

To envision, to implement, to direct and to coordinate a program of drone development presents many managerial problems. For example, the differing surveillance requirements of battle group, division, corps and army suggests that design programs must be initiated for drone systems of different endurance and payload capabilities. If

programs are to result in the production of modern equipment—equipment that is consistent with the state-of-the-art at the time of its issue—these programs must be planned in terms of the mid-and long-range time periods as well as the present. Additional problems involved in preparing a drone program are the development of requisite guidance and control systems, navigation systems and such sensory devices as cameras, radars, infrared equipment and television devices.

Among the drone systems that we currently have programmed, even the ~~drone~~ systems require a constant pushing back of the state-of-the-art curtain. This involves technological breakthroughs in both basic and applied research. Managing and directing the implementation of these and other programs must take into account the large number of items and subsystems involved. Extension aids enable the review and analysis of the programs concerned as such review and analysis is necessary.

Major Programs

The managerial aspects of drone system development are paralleled in the other surveillance systems that are under development by the Combat Surveillance Agency. High resolution airborne radar equipment, infrared scanners, lightweight inertial navigation systems and ground radar that are designed to detect intrusion are among the other major programs with which we are presently concerned.

With the support of the Army Electronic Proving Ground, the Army Signal Research and Development Laboratory, Project Michigan, and the combat surveillance project of Cornell Aeronauti-

cal Laboratory—and with the cooperation of U. S. industry—the Combat Surveillance Agency has made significant progress toward the development of an adequate combat surveillance and target acquisition capability within the U. S. Army. Our development program is paying off with equipment that is effective and reliable. The problems of the combat surveillance field present a challenge to management not only within the Army but also within research institutions of the United States and within American industry.

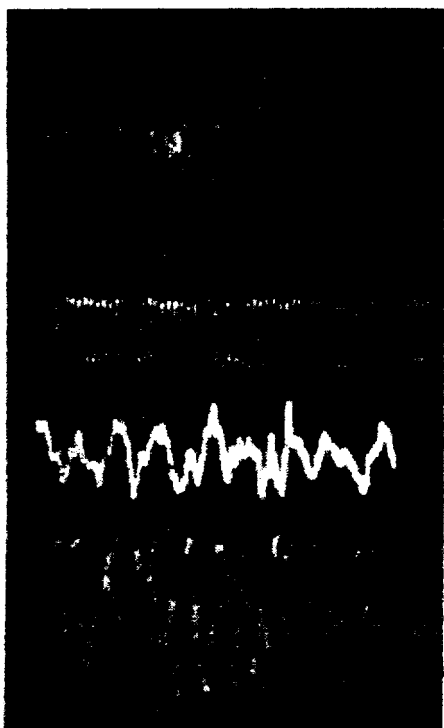
Sentry Against Crawlers

The first radars of World War II could detect invading aircraft (giving the R.A.F. a big advantage in the Battle of Britain), but they were not much good on smaller targets. Modern radar is vastly more sophisticated, and a wondrous new refinement is an eye developed by the Army Signal Corps in collaboration with Hazeltine Corp. It can stare through darkness or fog at a terrain of tangled scrub and tell if a man is crawling through it two miles away; it can look at a walking human six miles away and tell whether its target is male or female.

The Combat Surveillance Radar AN/TPS-25 (called Topsy 25 by the G.I.s) is easily mobile, depends on the

tracks. A wheeled vehicle makes a whine that increases in pitch as its speed increases. A man walking toward the radar sounds like "ump-ump-ump,"—each "ump" being Topsy's reaction to the relatively fast movement of his legs as he takes a step. A woman's skirt has no effect, but she moves her arms differently and swings her hips more, so the radar sound that comes from her has more frills, lacking the plain solidity of the male "ump-ump-ump."

A crawling man does not usually move as fast as 1 m.p.h., the lowest speed that Topsy 25 detects, but movements of his arms and legs exceed the speed limit. So they give a characteristic sound and warn the radar sentry that in the darkness somewhere two miles away, someone is crawling who presumably means no good.



U.S. Army.
TIPSY 25 SOUNDS ON OSCILLOSCOPE*

Hips make a difference.

Doppler effect, which detects slight movements toward or away from the instrument because of the change in frequency of radio waves reflected from moving objects. When set up on the front line, Topsy 25 is trained toward the direction of probable enemy approach. It covers an angle of about 30°, and if anything is moving there, the operator hears a crackling sound like radio static. He then narrows his beam and focuses on the suspected object. When he pinpoints it, he hears a characteristic sound, which is simultaneously displayed as a wave pattern on an oscilloscope.

A vehicle (tank, jeep or train) twelve miles away is easy to identify. A tank sounds very much like the clanking of its

Army Permits Peek At Its Big Snoop; New Radar Has Keen Combat Eyes

The Army this week demonstrated at Ft. Myer, Va., a new ultra-sensitive front-line radar with ears which in daylight, fog or darkness can spot targets such as a tank, truck, jeep, or crawling soldier at a distance of 10 to 15 miles.

The new radar is part of an overall program under direction of the Combat Surveillance Agency (THE JOURNAL 25 July) and was developed jointly by the Army Signal Research and Development Laboratory at Ft. Monmouth, N. J., and the Hazeltine Corporation of Little Neck, N. Y.

The set will spot a rolling tank, truck or jeep at ten miles, or a soldier crawling on the ground two miles away. The Army said these are average distances over typical battle terrain.

In one test, under ideal conditions, the set spotted a soldier walking 15 miles away.

Each type of target produces a characteristic sound in the radar. An experienced operator can distinguish the sound made by a walking soldier, the two-toned whistle of a tank, the steady whine of a truck or jeep, a chorus of sounds created by a patrol of soldiers, and the pulsating rumble indicating soldiers in marching

formation.

In addition to the sounds, the operator can watch the set's radar scope to get more precise information on a target's position and direction of movement.

The set scans a 30-degree sector of a battlefield. When the operator hears a suspicious motion, he can narrow the radar beam and zoom in on the target. A tiny indicator light, mounted under a map of the area, shows the object's position while numerical dials show the target's exact position. This information can be used for rapid placement of artillery fire or other tactical measures.

This latest development will provide the Army with the only ground-to-ground radar which can detect moving targets at such long range and which can operate in fog or darkness, the Pentagon said.

The movement monitor, which can be set up in a frontline position in less than half an hour, is made up of a portable shelter containing the controls and displays, and a separate antenna mounted inside a five-foot plastic bubble on a 20-foot pole at a strategic rearward position.

The entire system can be packed in the shelter for rapid transportation by helicopter or on a small two-wheel trailer.

* From top: train, automobile, walking man, walking woman